confusion. The chapter on senile dementia is distinctly good and very instructive.

Under "psychoses without a well-determined etiology, which are apparently based upon a morbid predisposition," are found manic-depressive insanity, paranoia, and constitutional psychopathic conditions, such as mental instability, sexual perversions and inversions and obsessions. Paranoia is very briefly described under the title of "Reasoning Insanity." We strongly disagree with the author in his use of this term; it is by no means a good one, and is, in addition, confusing, since other writers have used it as designating the maniacal stage of manic-depressive insanity.

Epilepsy and hysteria are described under the heading of "Psychoses Based on Neuroses," and the concluding chapter is devoted to the consideration of the arrest of mental development.

The book is well translated, and the index is carefully compiled. This manual undoubtedly has its merits, but, as we have already stated, it will scarcely appeal to the practitioner, as the description of treatment is somewhat meagre, and the student will find the subject-matter almost too condensed. In any future edition the author will do well to correct these defects, for by so doing he will render his book a useful manual on psychiatry.

OUR BOOK SHELF.

Experiments with Plants. By Dr. W. J. V. Osterhout. Pp. x+492; illustrated. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1905.) Price 5*s.* net.

THE author defines his aims in the following words (p. 7):—"The numerous questions which young people ask about plants are best answered by themselves. . . . To put them in the way of doing this so far as possible is the object of this book." In accordance with this plan, the apparatus used is of a rough and home-made description, constructed of fruit jars, lamp chimneys, clothes' pegs, india-rubber bands, and sealing-wax. Much ingenuity is shown in the design of apparatus so put together. Whether a sufficient degree of stability is always obtainable may perhaps be questioned, but from the author's point of view the advantages of his method certainly outweigh any such shortcomings. One great merit in the book is the insistence on the necessity of control experiments, which are especially needful with rough methods. The book is divided into chapters headed "The Work of Roots"—of leaves, of stems, &c.—ending up with a chapter on "Making New Kinds of Plants," which is a statement of what breeders and experimenters on variability have done rather than instructions for the making of such experiments.

The author very properly recommends common plants for use; but why students of botany should be confined to such names as "Kentucky Coffee Tree," "Dusty Miller," "Live Forever," "Switch Plant," it is difficult to say. Occasionally we find the scientific name, and in this way we learn that a "Wandering Jew" is a Tradescantia.

Most of the experiments are clearly described, but we have been puzzled over some of them. For instance (p. 191), the method of answering the question, "Does the leaf decompose carbon dioxide?" seems to us to involve passing a lighted candle under water into a jar of air. Here and elsewhere in the book the author neglects simple and striking methods. It is important that the student should be convinced that oxygen is given off by green leaves in light. The above-mentioned experiment is not satisfactory, whereas Engelmann's blood method is both simple and convincing. Again, the well-known plan of counting the bubbles given off by submerged plants in light, though not free from errors, gives useful comparative data for the study of assimilation. In the same way we think that more fundamental experiments should have been given under the heading of "Stomata." Stahl's cobalt method, which is merely mentioned in a note, can be used by the most elementary of students to demonstrate important facts.

In spite of some faults, the book will be found of value to anyone compelled to give a course of physiological botany under conditions which preclude the use of ordinary laboratory fittings.

Conversations on Chemistry. Part i. General Chemistry. By W. Ostwald. Authorised translation by Elizabeth Catherine Ramsay. Pp. v+250. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd., 1905.) Price 6*s.* 6*d.* net.

THE German original of this book has already received sympathetic notice in NATURE, and in connection with the translation now before us it is necessary to add little more than that Miss Ramsay has done her work with much skill, and has made the dialogue not less natural and vivacious than it is in the original. It is impossible to read the book without a feeling of refreshment and amusement, or without admiration of the ingenuity and resource of its philosophical author. It seems hardly fair to say that we have here a revival of Dr. Brewer or Mrs. Marcet. There are two striking differences between the old and the new dialogues. In the first place neither master nor pupil in Prof. Ostwald's book is endowed with that austere and depressing piety of mind which, to the unregenerate, provided perhaps the most afflicting feature of the older works. In the second place Prof. Ostwald's book shows a masterly treatment not only of the real difficulties of chemistry in itself, but a perfect appreciation of the pitfalls that beset the pupil in the early stages of learning. It is difficult to suppose that any teacher will fail to find something useful or to gain some valuable hints from reading the book, and on this ground it must be warmly recommended.

It would, however, be a misfortune if a teacher constrained his teaching to the exact course of the dialogue, and, of course, it would be worse still if he set so many pages as a lesson to be learned by the pupil. The real usefulness of the book will probably lie in the example it affords of the life that may be imparted to teaching when, on the one hand, the pupil is allowed a fair chance of thinking out things for himself and a full opportunity of frankly saying what he thinks, and when, on the other hand, the teacher takes the part of a guide, philosopher, and friend who has a soul above dictionaries and examination papers. A. S.

Mathematical Recreations and Essays. By W. W. Rouse Ball. Fourth edition. Pp. xvi+402. (London: Macmillan and Co., Ltd., 1905.) Price 7*s.* net.

THIS edition differs from the third by containing chapters on the history of the mathematical tripos at Cambridge, Mersenne's numbers, and cryptography and ciphers, besides descriptions of some mathematical recreations previously omitted. The book has thus become more miscellaneous in character, but the additions fit in very well, and are all entertaining. Mr Ball writes with enjoyment of his subject, and

in a very agreeable style; moreover, he does not assume the reader to possess any knowledge of advanced mathematics. For those who wish to study any of the more important topics in detail he gives ample references; for those merely in search of diversion he provides a mine of amusement, in exploring which many pleasant hours may be spent. And there are some unsolved problems mentioned which the amateur with a mathematical turn of mind may attack with nearly as much chance of success as the expert; for instance, to give a strict proof that only four different colours are necessary to colour a map distinctly. Altogether this is an excellent work of its kind, and ought to find a large number of readers; even those who have a former edition will be likely to buy this one, if only for the sake of the very interesting account of the vicissitudes of the mathematical tripos.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

The Rate of Formation of Radium.

THE production of radium from uranium has now been observed experimentally; the rate of production is not, however, in accordance with the quantitative theory. Mr. Soddy's observations (*Phil. Mag.*, June, 1905) gave a rate of production of only one-thousandth of the theoretical amount. An experiment which I made on a specimen of uranium salt, known to be at least thirty years old, has confirmed Mr. Soddy's conclusion so far as to show that the mean rate of production of radium could not have exceeded a hundredth part of the theoretical amount. It may, of course, have been much less, since the amount of radium initially present is unknown.

The explanation of this discrepancy, which has been suggested by Mr. Soddy and others, is that there may be a transitional product. If this is the case, it is to be expected that the rate of production of radium from uranium initially purified will be found to accelerate as time goes on. In the meantime, I am trying an experiment which promises to give the required information more easily.

The transitional product, if it exists, must be contained in pitchblende. If, therefore, we could remove all the radium, but as little else as possible, from a solution of pitchblende, the increased rate of production of radium might be apparent.

Fifty grams of the best pitchblende were dissolved in nitric acid. The insoluble residue was fused with sodium carbonate and added to the solution. The whole was evaporated to small bulk to render silica insoluble; more dilute acid was added, and the silica filtered off and rejected. The metallic bases were thus got into solution.

The solution was freed from radium so far as possible by adding barium nitrate solution in small portions, alternately with equivalent quantities of potassium sulphate. Four and a half grams of the barium salt were thus added. After this the amount of radium remaining was determined by its emanation; three determinations gave, on an arbitrary scale, 69, 58·5, 61·5, mean 63·0. After an interval of three and a half months the amount was again determined. The values were 73·5, 74·5, 72·0, 75·0, 72·5, mean 73·5. It appears probable that this increase is significant, since each of the second series of numbers is larger than any of the first series.

Assuming that the difference is significant, the rate of production per gram of mineral per year would be, on the same scale, 0·723. The equilibrium quantity of radium, the amount, that is, in the untreated mineral, was found to be, per gram, 10,100. If radium decays to one-half its initial quantity in a thousand years, as theory indicates, then the production in one year from a gram of the mineral should be $10{,}100/1{\cdot}45\times1000=6{\cdot}9$, about ten times the observed amount.

The increase is insufficient to inspire complete confidence. It seems most probable, however, that there is an increase much greater than in Mr. Soddy's experiments with pure uranium salts. It would not have been difficult to remove all traces of radium, and then the increase (if real) would have been unmistakable. It was feared, however, that the barium precipitation might remove part of the hypothetical intermediate product. It seems likely that this is the case, since the rate of production is still less than theory requires.

A little longer interval will, it is hoped, give a conclusive result. It is intended to try other methods of separating the radium, in the hope of avoiding all loss of the intermediate product.

R. J. STRUTT.

The Effect of Radium on the Strength of Threads.

IN a note which appeared in NATURE on February 4, 1904, Lord Blythswood announced his observation of the destructive action exerted on cambric by the radiation from radium. Having at our disposal recently twenty milligrams of radium bromide which had, for a time, nothing better to do, we investigated the progressive decrease of strength of threads exposed to its influence. In order to have examples of both animal and vegetable fibres, we used unspun silk and ordinary bleached cotton thread.

Ten pieces of thread were exposed at a time. The threads were folded round a strip of writing paper and held in place by being caught in notches cut in the edges of the strip. The paper was laid on the top of the capsule containing the radium, so that the ten threads were exposed to the bare radium at a distance of about half a centimetre. The whole was enclosed in a lead box. After a certain period of exposure the average breaking strength of the threads was taken and plotted against the time. The points obtained lay closely on a smoothly descending curve.

In the case of the silk fibres the loss of strength went on at a practically uniform rate from the beginning up to the longest duration of exposure given (seven days). The initial strength was 78 gms., and this decreased by about 4 gms. per day. The cotton threads, on the other hand, gave a curve which fell more rapidly in the early than in the later stages. The strength began at 370 gms., and decreased at first by about 60 gms. per day. After ten days the rate of weakening was about half this. The longest exposure given was seventeen days; at the end of this time the strength was reduced to 50 gms. The different behaviour of the two kinds of fibres may be due to the much greater thickness of the cotton threads.

The effect seemed to be due entirely to the α rays. A piece of paper was interposed between the threads and the radium, and three days' exposure was given. In the subsequent test none of the threads broke at the exposed part, and the strength was not decreased.

We tried the effect of moistening the cotton threads, the two ends of each thread being left, during a three days' exposure, dipping into a vessel of water. On opening the lead box, in which the whole arrangement was enclosed, it was found that the radium bromide, being hygroscopic, was wet and partially dissolved. The strength of the threads was found to be higher than when exposed in a dry condition for the same period. The difference was too great to be attributed to the increase of strength imparted to threads by moisture, and was plainly due to the decreased emission of rays accompanying the solution, and the consequent removal of the emanation from the radium. We traced the course of the recovery of activity by the dried radium by making a series of three-day exposures of dry threads. The effectiveness of the radiation as measured by the weakening of the threads came back by regular steps in about a fortnight to a value slightly greater than its original one. This may have been due to a re-arrangement of the upper surface of the powder, which was not, at the beginning, very regularly spread over the bottom of the capsule.

HILDA P. MARTIN.
W. B. MORTON.

Queen's College, Belfast, August 8.